

Performance measurement in
environmental management at the
local level: an experiment and
proposal with reference to
Switzerland

■ Bernard Dafflon and Sandra Daguet

FACULTÉ DES SCIENCES ECONOMIQUES ET SOCIALES
WIRTSCHAFTS- UND SOZIALWISSENSCHAFTLICHE FAKULTÄT
UNIVERSITÉ DE FRIBOURG | UNIVERSITÄT FREIBURG

**Performance measurement
in environmental management at the local level:
an experiment and proposal with reference to Switzerland**

Bernard Dafflon and Sandra Daguet¹
(Final version, March 28, 2012)

Abstract

This paper deals with the management of three environmental policies at the local level: clean water distribution, sewage and wastewater treatment and household solid waste collection and treatment. The argument is that applying the benefit principle for financing these services will enhance allocative efficiency, budget and environmental accountability, and contribute to induce environmental friendly attitude. The paper is organised in two parts. Because there is no fundamental seminal theory in environmental management, Part One summarizes the analytical foundations in combining three disciplines: political economy, law and environmental accounting. The original contribution of the paper is to mix them in a coherent process which also corresponds to the Directives 2000/60 and 2008/98 of the European Parliament in the fields of water policy and solid waste.

Part Two develops a possible technique for defining and measuring the performance in order to assess the feasibility of our proposal. The data cover the 168 communes of the Canton Fribourg for the 1996-2009 period. The tested hypothesis is that the cost coverage ratio is an accurate measure of performance in the management of the selected environmental functions. But for accuracy – thus for improvement in policy implementation and practices - the test requires an in-depth command of the real situations because available data need to be treated before measurement. With the proposed procedure, the results verify efficiency in production, full information and no strategic behaviour from economic agents and politicians, and managerial accountability.

Key words

Benefit principle of taxation, environmental accounting, environmental legislation, environmental policy, environmental taxation, polluter-pays principle, user charges, user-pays principle, performance analysis in environmental management.

JEL classification

H23, Q53, Q58

¹ Bernard Dafflon (bernard.dafflon@unifr.ch) is full Professor of Public Finance, Sandra Daguet (sandra.daguet@unifr.ch) is research assistant, both at the Department of Economics, University of Fribourg. The authors thank Michael Keller, Per. G. Fredrikksen, Aldo Ravazzi Douvan, Barbara Ermini and Rémy Le Boennec for their comments. The usual disclaimer applies.

1 Introduction

This paper deals with the management of three environmental policies at the local level: clean water distribution, sewage and wastewater treatment and household solid waste collection and treatment. The argument is that applying the benefit principle for financing these services will enhance allocative efficiency and contribute to induce environmental friendly attitude, budget and environmental accountability in the jargon of the day. Yet implementation of the benefit principle requires robust guidelines to achieve these objectives – not to be found in theoretical model, but in learning by doing practices.

The argument is developed in two parts. In the first one, sections 2, 3 and 4 summarize the analytical foundations in combining three disciplines: political economy, law and accounting. This transversal approach deserves an explanation. As we shall demonstrate, there is no fundamental, seminal theory to be exposed. The foundations of environmental management at the local level are based on simple theoretical arguments: the original contribution is to mix them in a coherent process.

Section 2 stresses the differences between a Pigouvian (environmental) tax and user charges earmarked to environmental local public services. A Pigouvian tax is one of the possible environmental policy tools - alongside norms and tradable pollution rights - which aim at reducing pollution in general. Its objective is to force better environmental and economic results based on social costs and benefits rather than private ones when the market is unwilling or unable to account for externalities. User charges are totally different in nature: they are prices for financing physical measures for reducing pollution.

Section 3 presents the legal framework for environmental management in a federal structure (in relation to Switzerland in this paper: but one can generalize). Clean water distribution, wastewater and solid waste management have at the same time market as well as collective characteristics (Dafflon, 2010, pp. 44-47). Thus, the risk of local strategic behavior is real. With (negative) externalities, and when the environment cannot be privately owned, some rules of the game have to be issued – namely to define property rights on clean water, clean air, unpolluted landscape. Second, environmental management at the local level is asymmetric and spillovers territorial local frontiers: upstream jurisdictions have access to clean water and reject wastewater; what about downstream jurisdictions? Functional and institutional limits do not coincide. Cooperative Nash equilibrium would be better: but the prisoner's dilemma model shows that an external benevolent hand has to intervene in order to obtain cooperation. And finally, information costs about the consequences of pollution (on health, on the eco-system balance) and moral hazard issues (in the local behavior of neighboring jurisdictions; the fact that users of the services are captive of natural monopolies) also justify a robust legal framework.

Section 4 details the accounting system that is necessary in order to obtain correct information for policy management, pricing and production efficiency. The issue is more than simply technical. A proper budgeting and accounting system gives information about the production functions for the three services, the delivery of intermediate or final consumptions. It guarantees that user-pays and polluter-pays principle are respected and

that user charges are not disguised taxes. Also, it allows benchmarking and performance measurement.

The second part of the paper in section 5 develops a possible technique for defining and measuring the performance in order to assess the feasibility of our proposal. The practical analysis and experiment is based on three functions, clean water distribution, wastewater and solid waste management in the 168 communes of the Canton Fribourg. The data cover the 1996-2009 period. This canton has been selected for three reasons: (i) we have access to all data, thus are not confronted with the problem of selecting sample(S); (ii) user charges in the three selected domains have been introduced in 1981, so the question of trial-and-error initial hesitation is overcome; (iii) confronted with doubtful first-face result, we were able to access to detail accounting of the communes in order to verify the tested hypothesis. The tested hypothesis is that the cost coverage ratio is an accurate measure of performance in the management of the selected environmental functions. It verifies efficiency in production, full information and no strategic behaviour from economic agents and politicians, and managerial accountability.

2 The political economy of environmental user charges

This section is organised around the distinction between a Pigouvian tax and user charges, crucial in the implementation and management of environmental services at the local level. We consider in sequence the differences between environmental taxes and charges, the benefit principle as a reference for the introduction of user charges in two forms following the user-pays and polluter-pays principles.

2.1 The distinction between environmental taxes and environmental charges

Environmental policies include a wide range of instruments: standards, subsidies, fiscal instruments, tradable permits, voluntary agreements, etc. The two main fiscal instruments are environmental taxes and environmental charges, which derive from two different economic concepts. Table 1 helps to clarify the issue. It is organized around two criteria:

- the objective (in columns) refers to the purpose of the State when it introduces a fiscal instrument, either to raise revenues for the public budget ("fiscal" in the first column) or to influence the behaviour of agents in a certain way, here in a more environmental-friendly way ("incentive" in the second column);
- the counterpart criterion (in rows) indicates if the payer receives a service in exchange of his payment (in line with the benefit principle in the second row) or not (first row).

Table 1: Illustration of the difference between tax and charge

	fiscal objective	incentive
Sovereign State without counterpart	Income tax VAT Vehicle tax I.	Pigouvian tax VOC tax ² IV. Environmental tax
Benefit principle with counterpart	Connection charge Drinkable water user charge Waste water discharge fee Solid Waste charge II. Environmental charge	III. Emission charges ³

Source: adapted from Pillet et al, 2001, p. 45)

This classification leads to four types of instruments:

- I. Traditional taxes, such as income and wealth tax, or VAT, which are unrequited payment levied to finance the general public budget.
- II. Causal charges paid in exchange of a good (water, passport, etc.) or a service (solid waste collection for example). Those instruments are based on the benefit or user-pay principle.
- III. Specific environmental charges: for example, emission charges and landing fees in connection with air quality and noise.³
- IV. Pigouvian tax and the like.

The Pigouvian tax (IV) is a corrective incentive tax paid without counterpart, whose aim is to internalize the externality and modify the agents' behaviour via a higher price-signal. It refers to the Pigouvian normative proposal of internalizing the difference between the private and the social marginal cost via "extraordinary restraints" implemented by the State (Pigou 1932: 174-192) in order to restore an optimal allocation of resource. A Pigouvian tax is not earmarked; it should be paid to the general public budget. Since an environmental tax also yields a fiscal revenue, a right-to-left arrow is represented in Table 1.

For Baumol and Oates (1971), it is very unlikely that a Pigouvian tax can be calculated

² VOC is acronym for Volatile Organic Compounds. VOCs are released by burning fuels such as gasoline , wood , coal or natural gas . They are also released from solvents , paints and other products used and stored in the home and workplace.

³ Switzerland was (together with Sweden) one of the first countries in the world to introduce charges directly related to gaseous emissions from aircraft. (1997 Zurich, 1998 Geneva, 2000 Berne, 2003 Basle (in collaboration with French authorities)). The higher the emissions of contaminants and noise, the greater the charged landing fees. This creates an incentive for airlines to use quieter engines that produce lower emission. With effect from 1st April 2010, Switzerland changes to a European harmonized charging model. The new charge primarily depends on the absolute amount of NOx emissions.

Source: "Directive 33-05-27 "Aircraft Engine Emissions Charges in Switzerland" and www.bazl.admin.ch/fachleute/01169/02432/02435/index.html?lang=en consulted on June 30, 2011.

in practice because of the difficulty in assessing in money terms the optimal marginal externality and the pollution costs. They propose an alternative solution: standards procedures and environmental pricing. The decision-maker first sets externality standards regarded as acceptable to the whole society. Then he designs a tax that will conduce to this level of externality. As a result, the tax is effective rather than optimal. For the authors, this solution represents the closest and the most workable approximation of a Pigouvian tax and has also interesting optimality properties.

The next practical step is not taxing the externality, but pricing the service and equipment that will prevent or reduce a negative externality to acceptable standards.

2.2 The benefit principle and user charges

User charges (II. In Table 1) are based on the benefit principle: current and capital costs of a public service are apportioned among economic agents according to the exact benefit each of them derives from the consumption of the service (Buchanan 1968). Thus, a clear and direct link is established between the service delivered and its financing. Furthermore, the relation between the payment and the benefit is proportional: the more one uses the service, the more he will pay for it. The service has to be totally financed by the yield of the charges (full cost coverage); it does not burden the general public budget. The benefit principle represents the entry of market rules in the fiscal sphere because it introduces a direct connection between the one who uses the service and the one who pays for it.

The benefit principle is however a normative concept that needs some adaptations to be transferred in practice, where it becomes the user-pays principle (Dafflon, 1998, pp. 113-119; OCDE, 1998). First, four technical criteria must be respected: (i) the ability of identifying the individual beneficiaries; (ii) the ability to exclude from the service the non-payer; (iii) the moderate indivisibility of supply; (iv) reasonable external effects. In addition, once the technical criteria have been taken into consideration, the application of the benefit principle is subjected to two value judgements: (1) "less State": the benefit principle stimulates economic agents to have an efficient behaviour in their consumption of public goods, thus leading to less public services provided via the general budget; and (2) equity-related considerations: payment according to the use of the service and not to the users' ability-to-pay.

On the same issue, Schiavo-Campo (2007, pp. 71-72) proposes the following criteria:

- (i) clear legal authority: the legal basis to charge for service should be clearly defined;
- (ii) full costing of each service, regardless of whether the intention is to recover costs fully or partly. For partial cost recovery, this information will make transparent the subsidy granted for the service;
- (iii) appropriate pricing, that reflects full cost recovery;
- (iv) competitive neutrality: when pricing services, the costing should be accurate and incorporate all cost items.

Environmental user charges must be paid by individual agent in exchange of a counterpart service; payments are earmarked to the relevant service; total payment

should cover the service costs. But user charges also include an incentive part represented with the left-to-right arrow in Table 1. First, they give a corrective price-signal aimed at obtaining a more efficient use of the service. Second, the tariff can be designed in such a way that users will be more environmentally responsible. These are clear objectives stated in the two European Directives 2000/60 and 2008/98.⁴

2.3 Advantages and disadvantage of the user-pays principle

The user-pays principle aims at increasing the efficiency in producing a particular public service through both the quasi-market rule it introduces and the possibility of benchmarking costs and pricing in the jurisdictions producing a similar service. It has several advantages from an allocative (1, 2 and 3) and budgetary stands (4 and 5):

1. It avoids excessive demand because it includes the cost component in the decision of the agent who has to pay for the wanted service. It gives the real cost of the service and thus encourages a sparing use of the service (Dafflon, 1998, p. 112).
2. It avoids free rider behaviour because prices and services are closely linked (no “free lunch”).
3. It can lead to an improvement of environmental quality. If the service concerns an environmental service, standards often indicate the ways the service should be provided and treated (clean water supply or wastewater treatment for example). Moreover, a sparing use of the service also improves the environmental quality.
4. It can solve some aspects of financing the public sector. Indeed, it relieves the general budget by introducing a causal charge paid only by the one who uses the service.
5. It requires the introduction of cost accounting in public budget (see section 4). Clear accounting of production costs, information transparency and possible benchmarking processes are key elements of better accountability in those jurisdictions which are applying the user-pays principle.

The user-pays principle also raises equity issues. The agent must pay the price of the service according to its cost, whatever its personal situation in terms of revenue and wealth. Ignoring ability-to-pay can be seen as “unfair”. However, user charges are implemented to cover the costs of a service (allocation function) and apportioned according to the use of a service. They are not for targeted-redistributive policies. The connected argument is that the user-pays principle unloads the general budget and thus frees money for redistributive policies.

2.4 The polluter-pays principle in background

The polluter-pays principle comes from Welfare Economics and refers to internalizing externalities, i.e. taking into account the social costs (private and external costs) and

⁴ Article 9 of Directive 2000/60 prescribes member States shall take account of the principle of recovery of the costs of water services, including environmental and resource costs in accordance in particular with the polluter-pays principle. Water-pricing policies (to be implemented by 2010) provide adequate incentives for users to use water resources efficiently, and thereby contribute to the environmental objectives of this Directive. Article 14 of Directive 2008/98 states that the costs of solid waste management shall be borne by the original waste producer or by the current or previous waste holders. In accordance with the polluter-pays principle.

restoring the "real" costs (Barde, 1992, p. 210). According to OECD (1972), this principle means that the polluter should pay for costs of prevention and remediation against pollution in order to attain an acceptable state of the environment. Of course, the exact terms differs from one situation to another. The polluter-pays principle means the end of free environmental goods or services. For example, user charges should cover the costs of sewage and wastewater treatment on one hand, and garbage collection and disposal, plus solid waste treatment on the other hand. Both services cannot be treated as one global environmental service since economic agents use one or the other in different intensity. The same for drinking water.

3 The institutional and legal frameworks of user charges

In Switzerland, local governments apply three environmental user charges: (1) for the supply of clean (drinking) water (user-pays), (2) for sewage and wastewater treatment services and (3) for solid waste collection and treatment (polluter-pays).

To cut short, the institutional organisation is the following: the federal legislation sets out the standards of services: the bio-chemical quality of clean drinking water, the maximum pollution admitted for wastewater and solid waste rejects and the quality target that de-pollution processes should attain in the wastewater and solid waste treatments. The cantonal level coordinates the policy implementation and the territorial map of the services. The cantons also issue the production regulation, control and sanctions. The local level (individual communes or communes in public-law association) is responsible for the production of the services, service delivery, issuing the user charge tariffs. Financial management of the services falls in their responsibility in order to cover the costs of the three services.

The Federal High Court has issued case laws that constrain the autonomy of the commune in two directions: [1] in deciding the user charge tariffs and [2] in imposing specific managerial financial rules. These rules are valid for the three functions, of course with specific adapted regulations for each of them.

[1] The tariff must be decided by the local legislative (people's assembly or local parliament). It must explicitly states the following four points:

- (i) the definition of who are the users subject to the charges;
- (ii) the object of the user charge (designation of the services which are submitted to the user charge tariff);
- (iii) the criteria for the calculation of the individual charges in the tariff;
- (iv) the maximum amount of the user charges.

If one of the previous points is not properly formulated and written in the voted local ordinance, any user can contest in court the calculation and (semester or annual) payment bill he receives for the service (Knapp, 1991: 579 ss).

[2] Four managerial financial rules also result from past case laws and have been repeatedly reasserted by the Court since more than thirty years.

- "*Equivalence*": the charges must be proportional to the benefits received by the user.

The recommended tariff is binomial: potential users have to pay an access charge related to investment costs – this is a sort of insurance premium in exchange for the guarantee to benefit from the service when needed; the second component of the tariff must be related to the effective use of the service.

- *“Equal treatment of equal”*: user charges are related to the services provided and cannot be apportioned following other not-related criteria – for example the distinction between residential houses and secondary or vacation residences in tourist resorts is not permitted.
- *“full coverage of the costs but not more”*: on a medium time horizon, total (access and current) charges cannot exceed total (current, maintenance and investment) costs. User charges cannot be disguised taxes: any annual excess of revenue must be duly reserved for the same function and appears explicitly in the balance sheet. There cannot be compensation between the three functions. Financial reserves can be used for leveling out possible imbalance through time.
- *“time causality”*: defines the moment in time when the obligation to pay arises. For the access tax, it is the potential access to the service which fixes the obligation (the “insurance” aspect of the service). For the current tax, it is the effective measured consumption of the services.

In the canton Fribourg, the LGs’ general capacity to legislate on user charges is given in the law of September 25, 1981 on the organization and functioning of the communes, amended in September 1984 for that purpose. The added article 10 paragraph 1 letters e) and f) of the law gives to the people’s assembly or the local parliament the power to tax, to levy user charges, fees and duties, and to issue ordinance of general concern (“règlement de portée générale”). The ordinance provides the adequate legal text for each of the functions that LGs finance through user charges: it contains both a description of the function and the detail of the tariff as required by the Federal Court. Annex I contains a summary of the institutional and legal design for drinking water. Annexes II and III reproduce the same design for sewage and wastewater treatment and for solid waste collection and treatment. The three matrices are organized on the same basis, given in Table 2.

Table 2 Institutional and legal design for

	Federal	cantonal (Fribourg)	Local (Fribourg)	Federal Court
1	2	3	4	5
Ownership of water				
Definition of "drinking" water, quality				
Objective				
Responsibility for provision (offer)				
Coordination				
Production and delivery				
Pricing				
Control				
Possible note specific to one cell of the matrix				

Columns 2 to 4 represent the three institutional layers of government which share the function: it can be verified in the Annexes that though shared, there is no overlapping responsibilities – each level is assigned a proper role in strategy and general policy issues (federal), in the territorial and service coordination (the cantons) and service delivery and financing (the local layer). With twenty-six cantons, we have chosen one of them, Fribourg, at the cantonal and local level because we could access to the detailed statistical data in order to test the user charge performance in the three functions. Column 5 gives the case law references declining the requirements mentioned in the previous paragraphs : it is given only once in Annex I since the case laws have the same content and requirements for the three functions. The lines offer a series of selected criteria (our choice) which are significant for the political economic analysis of these three functions.

4 Accounting principles

The two previous analytical pieces can now be brought together. On the one side, the political economy of user charges commands that environmental services should be paid by beneficiaries according to the user-pays and polluter-pays principles in proportion to the services obtained. This equivalence will guarantee no excessive demand, no free lunch, and bring efficiency in production. On the other hand, the rules given by the Federal Court ensure fairness and accountability in the financial management of functions paid according to the benefit principle. In practice, this means that clear accounting principles have to be implemented so as to guarantee a quid-pro-quo correspondence between payments and expenditures. Transparent accounting information is a key component of the environmental management issues. In addition, in the Swiss law there cannot be one single general “environmental function”: the law does not permit compensation between one service and the other.

The accounting system must provide two classifications, which correspond to the needed information: [1] functional / sectorial expenditures and revenues, and [2] the economic nature of the outlays and revenue yields. For our present concern, the Harmonized Public Accounting System (HPAS)⁵ for local and cantonal government units distinguishes the functions [71] Clean drinking water distribution, [72] sewage and wastewater treatment and [73] garbage and solid waste collection and treatment (CDCF, 2008, p. 201). But the first difficulty is that the production functions of the three services are not homogenous. For example, function [71] Clean Water offers several intermediate products. This is sequenced in Figure 3. Possible – but not uncommon – situations are:

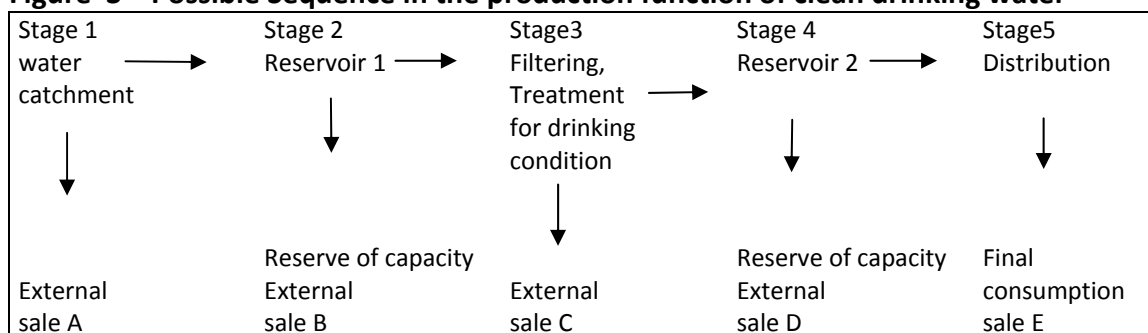
- (i) a commune demands to another the guarantee for a reserve of capacity – because its own production suffices only in normal time, but falls short in prolonged dry weather.
- (ii) a commune buys water to another at stage 3 (after treatment), but will store and distribute by its own network after this point.
- (iii) a commune only buy the guarantee of access to the water reservoir of a neighboring commune in order to obtain a sufficient BAR operating pressure in case of fire defense.

The example in Figure 3 shows that water production could be divided into five

5 For the presentation of the HPAS, see Dafflon, 2006, pp.216-223.

possible stages for selling water – sales A to D are intermediate sales, sale E corresponds to the final use. In this situation, major head [71] in the accounting system must be subdivided into minor heads in order to account for the effective production costs at each intermediate stage 1 to 4. The distribution tariff to local residents is calculated at stage 5.

Figure 3 Possible Sequence in the production function of clean drinking water



For the other two functions, it is no infrequent that the production is also divided:

- Function [72] distinguishes the sewage network [721], which is communal, from the wastewater treatment [720] which requires heavy capital investments, generates economies of scales and is most often organized in various forms of institutional horizontal cooperation between several local government units.
- Function [73] also separates the household garbage collection and treatment [730] from household waste recycling centers (HWRC)⁶ [731].

The second classification in HPAS gives the economic nature of expenditures and revenues. For the three analyzed functions, the cost items are presented in figure 4. This point of analysis is not simply a purely technical assemblage of words and numbers. It is absolutely necessary to establish the true costs of the production functions, possibly with a distinction between functional major and minor heads. With this information, it is possible to calculate the true activity-based costs, the average and marginal costs, and to distinguish between fixed and variable costs (Dafflon, 1998: pp. 128-134; 2010: pp. 53-55; Cokins, 2007, pp. 203ss). The organization of the user charge tariff depends from these calculations.

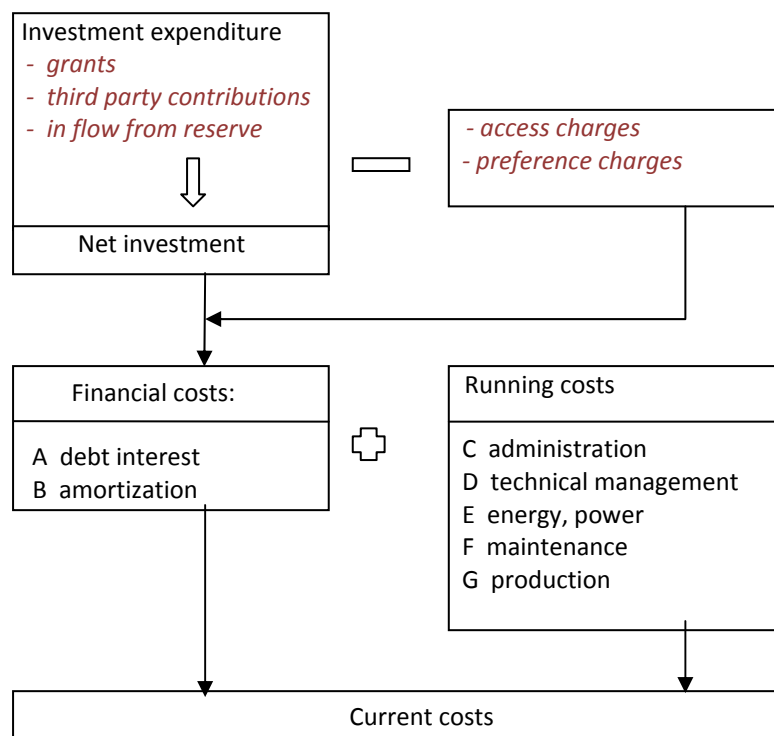
Figure 4 allows for various forms of user charge tariffs. First the distinction between investment expenditures and running costs can serve to establish access and preference charges⁷ to the network (clean water or wastewater) and to HWRCs for new investments.

⁶ A household waste recycling center (HWRC) is a facility where the public can dispose of household waste and also containing recycling points for recyclable waste such as green waste, metals, glass, PET, plastics, papers, tires, batteries, computer components, semi-durable household goods, etc. The basic idea is to sort out the waste in order to sell them as raw material to specialized recycling industries. The HWRC objective is to induce residents to sort out their waste so as to reduce the cost of solid waste treatment. The tariff must be organized in such a way that individual sorting pays off.

⁷ In figure 4, the access charge is paid by building owners in order to link their building to the water distribution or sewage communal network. It is normally based on the maximum potential use of the land

In places where the equipment already exists, and additional investments correspond to heavy maintenance works or technical improvement, access charges cannot be required a second time. Thus, financial costs (interest and amortization) are computed on an annual basis, together with the running costs. In many communes, the delivery of the service is considered as a joint production. Access to the network is considered as a collective service (the insurance value that the owner can access to water, can reject the wastewater he produces, can access to the HWRC): financial costs are billed on the basis of potential criteria of use (for example, the maximum capacity use of the piece of land, whatever the effective use). The effective use of the service is considered as a market product (the service is rival and excludable): running costs are distributed on the basis of effective use (cubic meters for water and wastewater, weight or volume for household garbage collection and treatment).

Figure 4 Cost and *Revenue* items for each production stage



to cover investment costs. It is a unique payment due at the time of effective access. "Preference charges" in the Swiss High Court decisions also refer to access: in this case, the land lies within the building zone, but is not yet built. The preference charge is a proportion of the access charge (up to 70% in some communes) because access is only potential, not effective (therefore a differentiation between the two situations is required); when the building is completed, then the remaining part (access charge – paid preference charge) is billed.

5 Implementation and performance analysis

The aim of this section is to verify the implementation of the user-pays and polluter-pays principles at the local level in the canton of Fribourg for three specific environmental functions: water supply [function 70 in the HPAS], sewage and wastewater treatment [71], and household solid waste collection and treatment [72]. We also measure the performance: the benefit principle is correctly applied if the cost coverage ratio [CCR = revenues / expenditures; without internal double accounting entries] = 1 for each of the three functions. With CCR=1, the proceeds exactly cover the spending: the function is self-financing via the corresponding user charges. The requirement of cost coverage corresponds to the logic of the user-pays (polluter-pays) principle in political economy (section 2) and to the legal requirement (section 3).

Verification and the performance analysis are realised in three steps:

- First, for the 168 LGs⁸ in the canton of Fribourg for the period 1996-2009. Data for the three functions are gross data, i.e. untreated data from the functional accounts of the communes, collected from the Service des communes⁹ (section 5.1).
- In the second step (section 5.2), we draw attention to the LGs in one of the seven cantonal districts, the Lake District, which comprises 26 municipalities.¹⁰ The Lake District serves as sample in the detailed analysis because it is the most representative district in the canton (over-cutting language and religious minorities, distribution of the working population, socio-demographic characteristics (Dafflon et al., 2004).
- The detailed analysis of the Lake District LGs is given for five years (2005 to 2009). In this sub-section (5.3), the published gross data are retreated according the accounting principles necessary for a correct application of the benefit principle, as explained in section 4.

The reasons for this sequential analysis are straightforward. First, the results in the time-series for all LGs are converging rather rapidly to a CCR = 1 for the three functions. The aim was to test if LGs have been so virtuous in implementing and financing environmental policies. As we have seen in section 3, LGs have no room of manoeuvre in selecting the objectives, and no particular incentive to achieve the pre-set federal standards – they act as agent of the double principal (the centre for the objectives and the canton for the implementation rules and coordination). The only local interest is that with a performance

8 The canton of Fribourg counted 259 communes in 1995. Owing to the cantonal policy for the voluntary amalgamation of communes, there were 168 in 2009. The 168 LGs serve for the analysis. Data for amalgamated communes have been added to obtain the figures for the new communes.

9 The Service of communes is the cantonal bureau in charge of supervising LGs in the canton. In all cantons, the cantonal supervision is a posteriori and limited to controlling the legal respect of the decision procedures and the correct implementation of the HPAS; supervision cannot intervene into the choice and the content of LGs' decision. It is a "legal" control (how it has been decided), not an "opportunity" control (what has been decided and why).

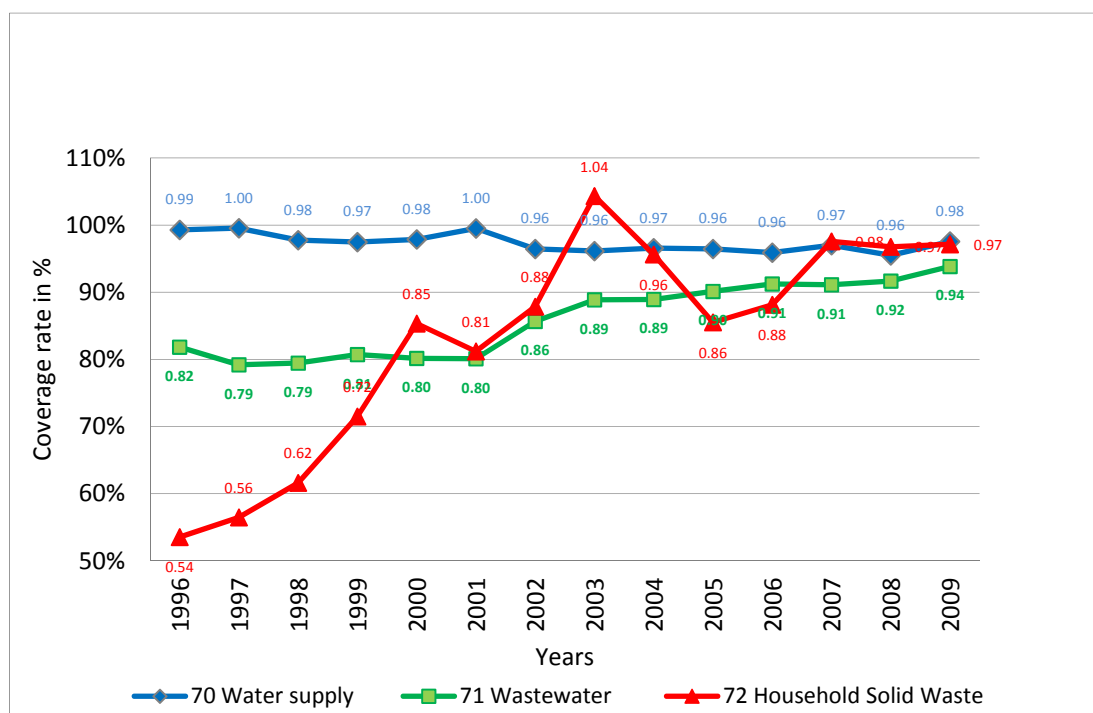
10 The Fribourg Canton (one of the 26 Swiss Cantons) is divided in 7 administrative districts: Broye, Glâne, Gruyère, Sarine, Lac(Lake in the text), Singine and Veveyse.

nearing 1, the financial burden on the general budget lowers, and so the pressure on taxation. The second reason is to test method: statistical data give macro information; but the user-pays and polluter-pays principles are effective only if properly implemented in the individual LGs, and for that we need accounting results of the individual communes. How important are the differences between macro data and the specific accounts of the communes?

5.1 Results for the 168 communes (gross data)

Despite that the communes were given the power to finance environmental functions through user charges already in 1984, the starting positions on the first referred year were dispersed. As can be seen in Figure 5, the cost coverage ratio was 54% for household solid waste collection and treatment, 82% for sewage and wastewater treatment and already 99% for clean water distribution. Over the period 1996 – 2009, important efforts were accomplished in order to improve the performance of benefit finance: on the last referred year, the cost coverage was 94% for wastewater, 97% for household solid waste and 98% for water. Figure 5 shows a remarkable improvement, which needs to be scrutinized in more details to understand the process.

Figure 5 Cost Coverage ratio, functions [70], [71], [72] for 168 communes, 1996-2009



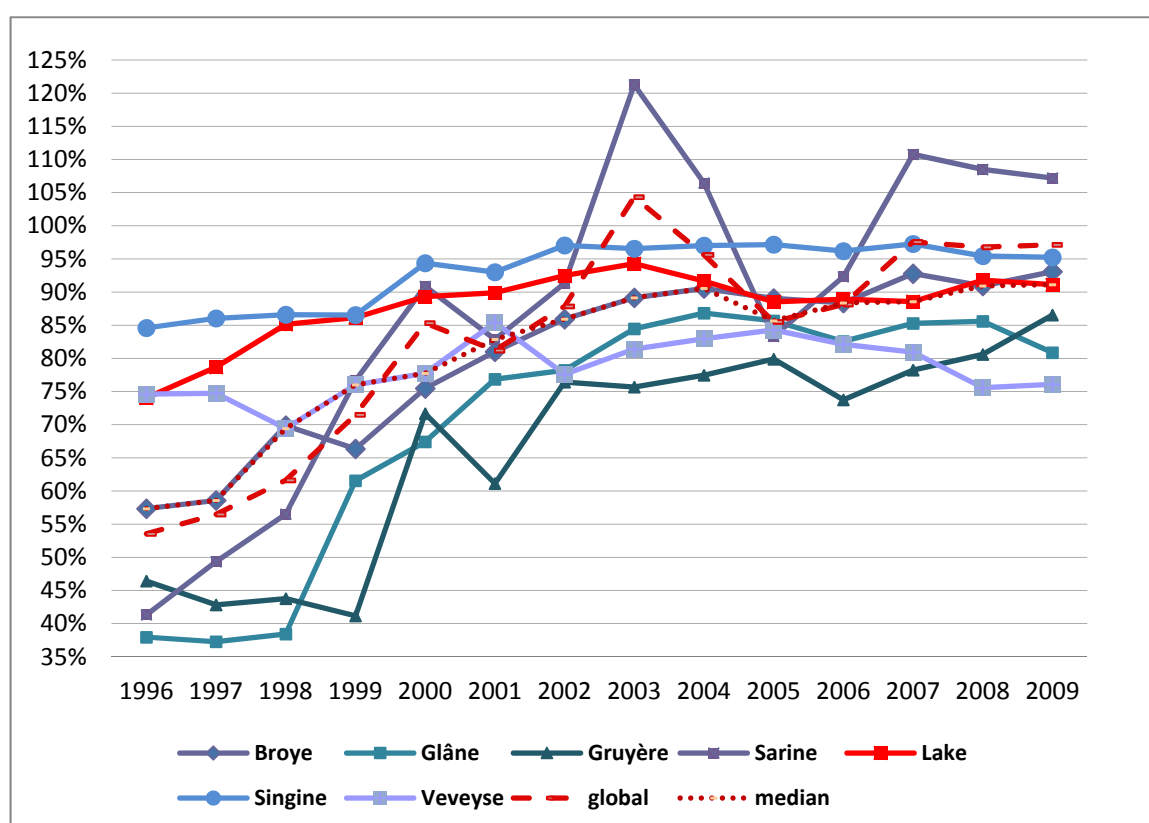
Source: Authors elaboration; gross data from the Service des Communes, canton Fribourg. Details for the 168 communes per commune, per district and per function can be obtained from the authors.

Note: the 2003 peak in [72] corresponds to an up-date of the user charge billing in the capital town which, owing to its importance, impacts on the total result.

5.2 Results for the communes of the Lake District: gross data

This sub-section presents the gross data results for the communes in the Lake District. Its objective is to position the 26 communes of the district relative to the other 142 communes in the canton. This exercise shows that their relative situation is not very different so that the conclusions of the detailed analysis in sub-section 5.3 can be extended and generalised. Figure 6 illustrates for one on the three environmental functions ([72] household solid waste collection and treatment), the situation in the Lake District compared to the communes in the six other administrative districts, to the average rate for the 168 communes and to the median for the districts. The same analysis was made for the other two functions with comparable results.

Figure 6 Cost Coverage ratio, function [72], comparison per district, 1996-2009



Source: authors' calculation, see Annex IV

Figure 7 recapitulates the results for those functions in the Lake District. Except for 2008, the cost coverage ratio for the supply of clean drinking water lies between 95 and 102 %. The coverage ratio for sewage and wastewater treatment shows an irregular trend: improvement between 1996 and 2000, stabilisation between 2000 and 2005 and a decrease since 2006. The ratio for household solid waste management has improved between 1996 and 2002, then marked a slight decrease and got better again at the end of the referred period.

Figure 7 Cost Coverage ratio, functions [71], [72] and[73], Lake District, 1996-2009

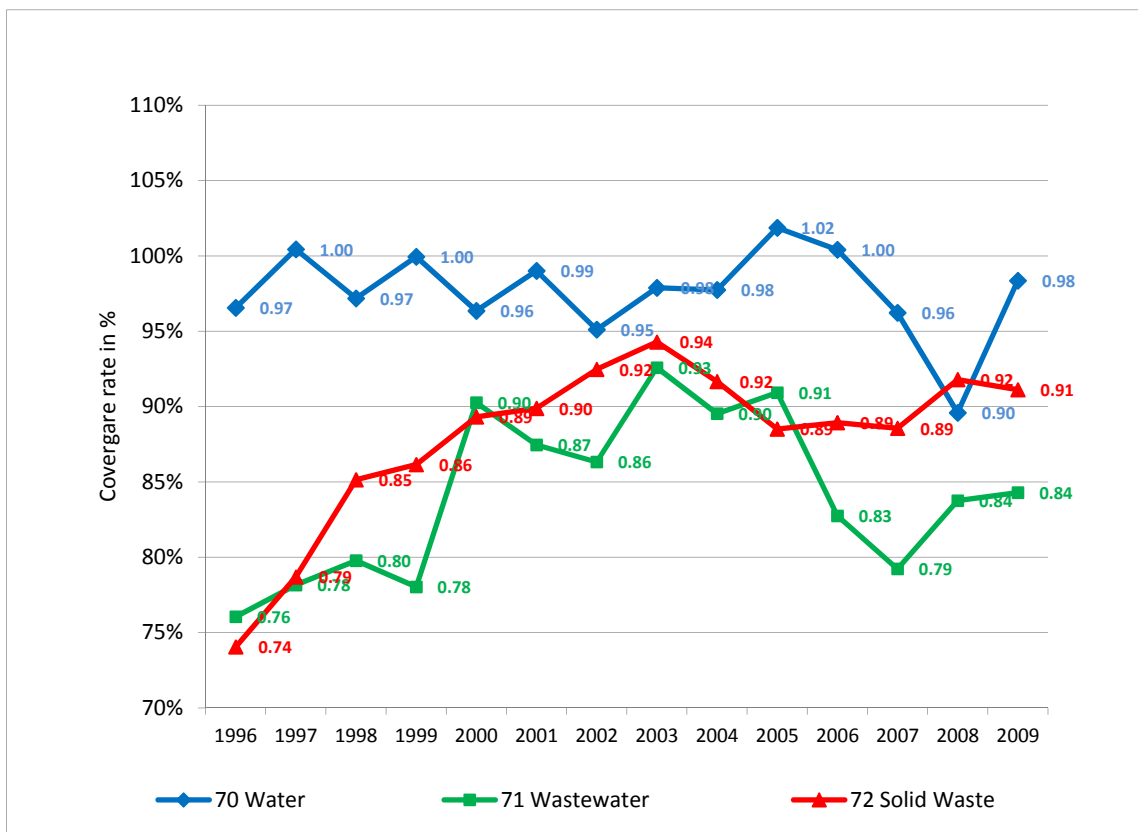
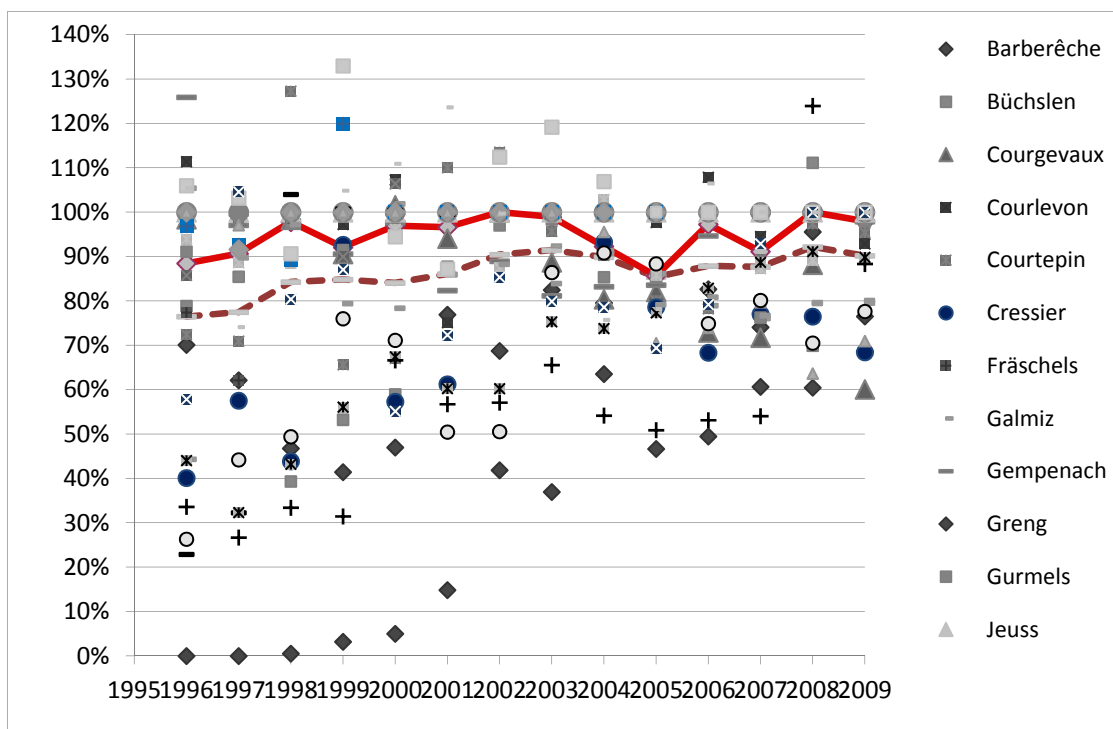


Figure 8 Dispersion of cost coverage ratio for solid waste management in the Lake District



Source: Authors' elaboration from data from the Service of Communes, canton Fribourg

However, the LGs' individual scores within the districts may register rather wide dispersion between the communes for one particular year, and from one year to another for a particular commune. Figure 8 illustrates the argument for the communes in the Lake District: for [72] household solid waste management, for example, the coverage ratios vary from 41% (1999) to 96% (2008) for one commune (Barberêche), and from the lowest 0% (Grenge, 2004) up to 133% (Ried, 1999). The dispersion ranges from 22% to 224% for [70] water and from 3 % to 158 % for [71] sewage and wastewater treatment. Such important dispersions need further investigation and analysis. True the dispersion reduces with time and is far less important in 2009 for the three functions (between 71% and 100% in Figure 8 for solid waste management). It remains to be analysed whether this is due to one or a combination of the following causes:

- (i) to a better information concerning the obligation to attain a threshold of 70% cost coverage;
- (ii) to better awareness of environmental issues;
- (iii) to the pressure of tax competition. Tax competition obliges communes to maintain or even lower their tax coefficient on individual income taxation and corporate profit taxation, and partly compensate with higher earmarked user charges. Environmental functions are best candidates in relation to the user-pays and polluter-pays principles.

5.3 Results for the commune of the Lake District: treated data

The observed general trend towards a better cost coverage of environmental expenditures through user charges needs to be analysed in detail in order to correct the results if necessary and to measure the real performance. The analysis covers the 26 communes of the Lake District for the last five years, 2005-2009¹¹, in order to smooth results and avoid particular situations. Data are treated in two ways:

- (i) Double internal accounting entries have to be identified and partly cancelled: only monetary expenses and revenues are considered (incremental accounting). Thus credit entries from reserves (economic classification 480 in the HPAS) are withdrawn from revenues when they are used to compensate for the current budget shortfall to smooth out the annual current result; debit entries (380 in HPAS) are withdrawn from spending when an excess of revenue serves to aliment the reserve earmarked for that specific function. Without correction, the current account does not give the true result of the fiscal year, because it includes compensatory entries. The corrected coverage ratio is:

$$(1) \text{ CCR1} = \frac{\text{Revenues} - (480) \text{Credit entry from Reserve}}{\text{Spending} - (380) \text{Debit entry to Reserve}} \quad \text{(ii) Accounting controls, on both}$$

¹¹ To give an idea of the work the analysis represents: it corresponds to scrutinizing 390 functional main head (26 communes x 5 years x 3 heads for [70] water, [71] wastewater and [72] solid waste) with around 20 entries per head/per year, that is around 8000 entries in the book in total.

spending and revenues sides, are made in order to check the right implementation of the user-pays (polluter-pays) principle. Effective controls are summarized in Table 9. If entries **a**, **b** and **c** are not accounted for, then the commune under-estimates the true spending: the cost coverage ratio is too high. And the contrary for entry **e**.

Table 9 Accounting controls criteria

<i>Spending</i>	a Recording of workforce spending (wages and social insurance contributions)
	b Recording of interests for public work assets in the balance sheet
	c Recording of amortization for public work assets in the balance sheet
	d Recording of a value in the balance sheet in any interests or amortization
<i>Revenues</i>	e Recording of the interests for earmarked reserve in the balance sheet

a. Usually monetary spending for material, furniture, services, energy and the like are correctly booked. However, omission in the spending for workforces (wages, insurance and social security contributions) is frequent, especially in small municipalities where one employee is in the charge of several tasks. The related entries for personal expenditures could be computed under one head only and not redistributed between the functions.

b. and **c.** Another frequent omission comes from financial charges. If the balance sheet contains an asset value which correspond to the capital investment, the current account should comprise outlays for interest and amortization. In the HPAS, interests and amortization are computed under head [9] dedicated to pure financial activities of the commune (general taxation, debt management, and management of patrimonial assets). Then interest and amortization are split among the concerned heads (functions). This last step can be forgotten.

d. There were some situation where interest and amortization entries were written in the book, but no asset value appears in the balance sheet. This does not conform to the Federal Court case laws: each entry must be duly justified. No asset value in the balance sheet would mean that the capital investment is totally amortized. Revenues in excess must aliment the earmarked functional reserve; it cannot be brushed out through non justified (interest and amortization) accounting tricks.

e. On the revenue side, proceeds (user charges, fees, reimbursement, sales, etc.) are usually correctly computed. However, when an earmarked reserve is given in the balance sheet, active interests should be paid to the related account. Earmarked reserves are either constituted in real asset (saving account), or they can on the short-medium terms serve for treasury purpose. But they must be remunerated to the exclusive profit of the same group (users or polluters) who paid the charges.¹²

12 The first case is clear : if the reserve is realized in the form of a saving account, the interest of these savings must be paid to the beneficiaries. According to the Federal Court, the beneficiaries are not the taxpayers, but those who have paid the user charges in excess. The earmarked reserve benefits to the corresponding function; the entry goes under the corresponding major head. The second case is less

With these corrections, the new cost coverage ratio is:

$$(2) \text{CCR2} = \frac{\text{Revenues} - \text{Credit entry from Reserve} + e}{\text{Spending} - \text{Debit entry to Reserve} + (a + b + c)}$$

In detail, the gross data have been corrected for equation (1) for all communes; and for equation (2) in the following way:

- b.** When there is an asset value in the balance sheet and no interest payment has been booked, we have calculated a 4% interest rate – which corresponds to the average interest paid on loan during the referred period. If an interest is booked, the booked value is maintained.
- c.** When there is an asset value in the balance sheet and no amortisation in the current account, we have calculated an amortization at the average rate of amortization for those communes which have booked correctly an amortization. The corresponding rates are linear at:
3,33% for 70 Clean Water Supply;
4,27% for 71 Sewage and Wastewater treatment; and
6,50% for 72 Household solid waste collection and treatment.
- d.** Where there is in the balance sheet an earmarked reserve and no interest entries in the revenue account, we have calculated an interest rate at 1%. In an interest is booked, the booked value is maintained.

No correction has been introduced for **a.** since we do not have information on how much labour force are necessary for the management of a specific function in a particular commune. There is no correction either for **e.** : if the cost coverage ratio is higher than 1, the excess of revenue should be paid into the specific earmarked reserve and not benefit the general budget of the commune. We have controlled that the payment yield of the surplus to the reserve is booked: this requirement is almost always respected. So this is not an issue.

Table 10 recapitulates the number of “virtuous” communes. In general, expenditures are correctly entered for [70] water supply: this is probably due to the fact that this function has already a long tradition of meter-pricing both in rural and urban communes. Wages and labour-related expenditure are not exhaustively accounted for in functions [71] and [72]. For sewage and wastewater treatment, it can be partly explained in view of the local management of the function: in many small municipalities, the surveillance of the sewages system is part of road maintenance duties. Entries are totally accounted under the head ([6] transport, roads and communication) without any transfer of charge from head [6] to [71].

evident: rather than constituting a reserve in the form of a saving account, the commune uses it for treasury purpose to save the difference in interest rates. Thus the reserve is due, written in the balance sheet, but not constituted. With the “we owe this amount to ourselves” argument, the payment of interests is omitted. This practice is not in line with the Federal Court case law: if “we owe it to ourselves”, the “we” and “ourselves” do not correspond to the same group. “We” corresponds to the taxpayers, “ourselves” to the users of the earmarked functions. With the omission of interest payment, we are in presence of a cross-subsidy that benefits to the general tax payer (no interest payment for treasury funds) to the detriment of the users of service [70], [71] and [72] (no interest entry for the earmarked reserves).

This is more surprising for [72]: almost all communes have a small household waste recycling center which requires manpower. Table 10 also shows a general neglect in attributing interests of the reserve to the relevant functions.

Table 10 Percentage of virtuous communes

Function = main head	Control criteria		Average 2005-2009	2005	2006	2007	2008	2009
[70] Water Supply	a	wage	90%	88%	88%	92%	88%	92%
	b	interests	88%	92%	85%	88%	88%	85%
	c	amortization	83%	77%	77%	88%	85%	88%
	e	interests of reserve	29%	19%	23%	31%	38%	35%
[71] Wastewater	a	wage	63%	62%	65%	65%	62%	62%
	b	interests	83%	85%	81%	85%	85%	81%
	c	amortization	78%	85%	69%	73%	81%	81%
	e	interests of reserve	45%	38%	42%	46%	50%	50%
[72] solid waste	a	wage	79%	73%	77%	77%	85%	85%
	b	interests	86%	88%	88%	85%	85%	85%
	c	amortization	87%	92%	88%	88%	81%	85%
	e	interests of reserve	66%	62%	65%	62%	69%	73%

The general results for the corrected data are illustrated in Figure 11 for the three functions. The gross data in dotted lines correspond to the results given in Figure 7 for the referred years 2005-2009, the corrected data to CCR2. The performance evaluation must distinguished function [70] Clean Water Supply from the two others.

[70] Clean Water Supply

On the five-year period, the corrected data give a much higher performance than the statistical gross values. The reason appears clearly in the detail analysis of the LGs' accounts. Amortisation and interest in the expenditure ledge of the current account are maintained for substantial amounts although the asset values written in the balance sheet are low or inexistent – the historical value of the asset has been totally amortized. This is explained by the fact that the water distribution networks in the communes were established already in the 1960s. The observed CCR2 higher than 1 corresponds to a sustainable investment policy for replacement and development. In the controlled sample, the excess of revenue is correctly earmarked in a specific reserve for future investment.

[71] Sewage and wastewater treatment

The gross data already indicate that the cost coverage ratios, between 91 and 84 %, are not sufficient. The corrected data worsen the results to ratios between 90 and 80%. The price signal is not adequate and the polluter-pays principle is not respected. This is a rather poor performance, approaching the 70% legal threshold (Annex II).

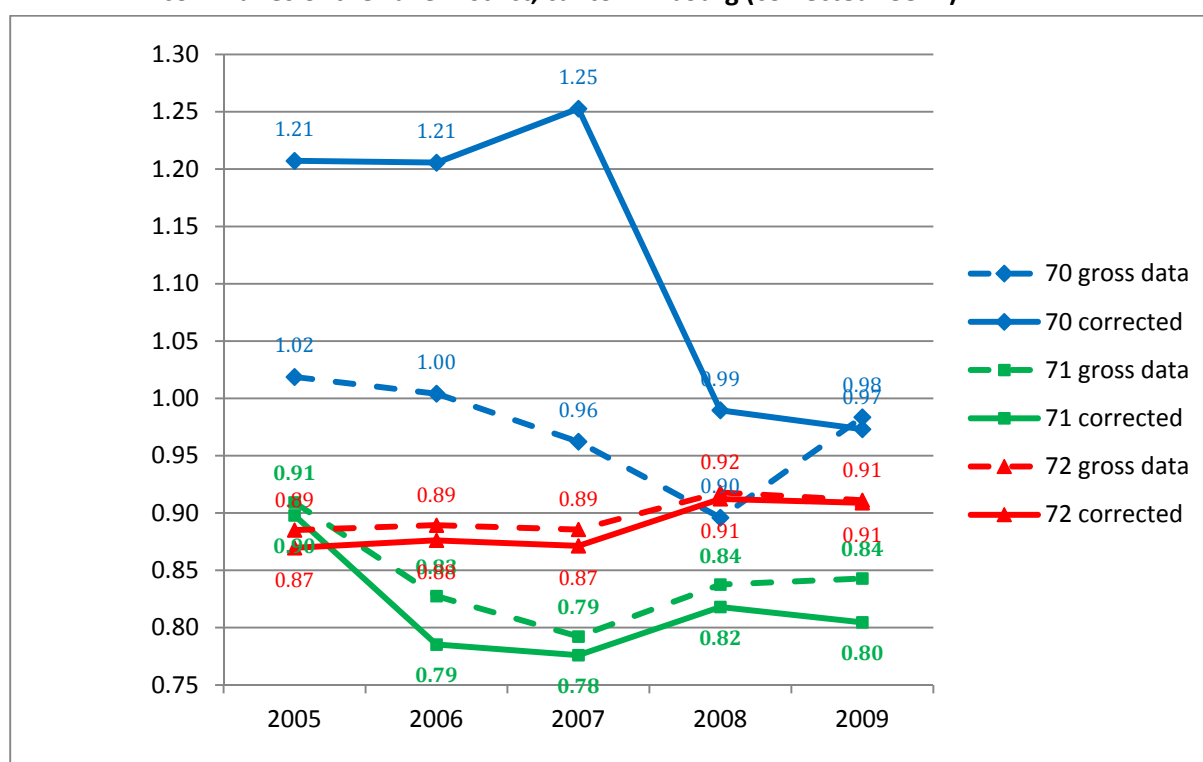
Amortisations were insufficient and were corrected in 45 annual situations out of 130 (26 communes x 5 years). In addition, amortisations were exclusively calculated on the historical past value of investment assets. In the sample, no commune respects the federal 1997

requirement that in addition, the communes have to take into consideration the pre-financing of the replacement of the existing equipment (financed through an additional “replacement charge” assessed on present beneficiaries of the service).

[72] Solid waste collection and treatment

For this function, the gross data cost coverage ratio run between 89% and 91%; the corrected data between 87% and 91%. The difference between the two series is not important. The most probable reason is the absence of important investment for this service: in almost all communes (all in the sample), solid waste collection is outsourced to private specialized firms; solid waste treatment is organised at the cantonal level in Public Private Partnership.¹³ The tariff, in CHF per ton, varies according to the nature of the solid wastes; prices are reduced for shareholder communes.¹⁴

Figure 11 Cost coverage ratio for 70 Water, 71 Wastewater and 72 Solid waste, 2005-2009, communes of the Lake District, canton Fribourg (corrected :CCR2)



Source: authors' calculation on corrected data

¹³ In the canton of Fribourg, this PPP is organized in a corporate entity called SAIDF (« Société Anonyme pour l'Incineration des Déchets de l'Etat de Fribourg »). The shareholders are: 25,15% the canton of Fribourg, 10,22% the canton of Vaud, 37,28% the communes within the service precinct (which includes the 168 communes of the canton Fribourg and 132 neighboring communes in the cantons Vaud and Berne), 25,18% Group e, and 2,14% the corporate entity itself. Note that the Group e is a corporate entity which produces electricity; it belongs for 78,545% to the canton Fribourg, 10% BKW FMB energy (which in turn belongs to the canton Bern), 5,544 to the Group itself, and the remaining 6% to miscellaneous investors.

¹⁴ The 2011 tariff varies from 172 CHF/ton for household solid waste to 491 CHF/ton for industrial waste not sorted; for shareholder communes, the tariff varies from 159 to 458 CHF/ton. Source: www.saidef.ch/fr/documents/; consulted July 7, 2011.

A second complementary way to assess the performance uses data clustering of the individual positions of the communes. We use five clusters:

- ratio below 70%, which is below the legal threshold;
- between 70 and 89%, with improvement still ahead;
- between 90 and 100 % as the acceptable target;
- more than 100%: in the medium term, this ratio would justify a decrease of the tariff or a clear earmarked reserve for future investments. The results are given in Table 12.

Table 12 Cost coverage ratio (CCR2) for 70 Water, 71 Wastewater and 72 Solid waste, 2005-2009, communes of the Lake District, canton Fribourg

cluster	70 Water	71 Wastewater	72 Solid waste
< 70%	24	35	16
70% to 89,99%	23	33	54
90% to 99,00%	23	21	29
99,01 to 100,99%	0	0	5
>101%	60	41	26
total	130	130	130

For [70] Clean Water Supply, over the five-year period (26 x5 = 130 observations), there were 47 occurrences of local situation with CCR2<90%. This corresponds to almost 40% of the individual position of the communes. For [71] Sewage and wastewater treatment, 68 observations, that is more than the half, are below the 90% ratio of cost coverage: this is a poor performance, particularly since no commune have yet integrated in their tariff the federal legal obligation to pre-finance future replacement investments. For [72] Solid waste, the performance is not better: 70 observations are with R2<90%. In global, if one considers that the performance target should be the full respect of the user-pays and the polluter-pays principles, there are 257 occurrences where they are not respected and only 133 observations with R2 ≥ 99,01%. These 133 observations are pushing up the district averages, represented in Figure 11; however the detail positions of the communes give other less brilliant results.

6 Conclusions

The conclusions of this paper take two roads: one relates to the method, the other to the results. We add some suggestions for the specific situation of the communes in the canton Fribourg, which served as laboratory.

First, the method:

- ✓ The implementation of the benefit principle for managing environmental policies at the local level is possible and will enhance allocative efficiency in giving the right price signal.

But, one must first distinguish carefully Pigovian taxation, directed to environmental macro-policies, from user charges in the management and delivery of environmental services.

- ✓ In practice, the benefit principle has to be transformed into the user-pays and polluter-pays principle. This transformation requires very precise and detailed legal specifications. The aim is to avoid asymmetric information, moral hazard and strategic behaviour both from the jurisdictions which will have to apply the principles for financing the services and from the beneficiaries of the services.
- ✓ For the user charges to give the right price-signal, it is necessary to clarify the production function of the service and distinguish intermediary services from final consumption.
- ✓ The quid pro quo relation between costs and financing must be explicit and clear. This requires an adequate accounting system. The HPAS in use is sufficient, but it must be adequately applied.

Second: performance measurement

- ✓ The performance analysis we propose is founded on a simple measurement: the cost coverage ratio. The hypothesis is that the user charge gives the right price-signal if the ratio [revenue/costs] is 1 or 100%. The lower the ratio below 1, the poorer the policy management and the worse the allocative efficiency. A ratio higher than 1 corresponds to a disguised tax unless the excess of revenue is earmarked for the specific function financed through user charges.
- ✓ However, this hypothesis is not easy to verify. It requires a good technical understanding of the production function of the service, coupled with an inclusive knowledge of the accounting system. One cannot simply take into account gross statistical data without an in-depth investigation of its accounting counterpart.
- ✓ Macro-measures are not sufficient. They give a general appreciation of the policy but not an accurate measure of performance. Macro measures leave open the question of compensation between LG with ratio higher than one and LG with lower ratio. Efficiency requires a quid-pro-quo relation between costs and charges in each single LG.
- ✓ The method developed in this paper avoids the macro problem because it scrutinizes the specific accounting position of each LG for each function over the referred period of time. Corrections are explicated. Given this, the results are accurate. However, the method is time consuming, in particular the investigation needed to go from CCR1 to CCR2. It remains to be examined how gross statistical data can be rearranged to obtain a good approximation of CCR2 in less time.

For the communes in the canton of Fribourg, which served to illustrate the method, some policy conclusions can also be offered.

- ✓ First, it appears essential that the supervising authority (the canton, the Service des communes) issues clear accounting guidelines for the communes in order to obtain the true costs of the functions. In practice, the need to go from ratio CCR1 to ratio CCR2 could be substantially reduced if the arguments in Table 9 were correctly accounted. With exact accounting, $CCR1=CCR2$, a result which would largely simplify the application

of the proposed method.

- ✓ The result in [70] water supply shows an over-pricing of the current delivery of drinking water. Despite the fact that the excess of revenue flows into an earmarked reserve, it would be more efficient to have a tariff with the user charge per cubic meter and a distinct replacement charge since the tax bases are not identical: effective consumption for the price of water; potential service (insurance and potential use) for infrastructure replacement and development.¹⁵
- ✓ For [71] wastewater, there are two problems. (i) In many communes the actual tariff does not cover the costs. An increase is necessary to obtain the right price signal. (ii) User charges, already insufficient for the present current budget, do not include replacement charges, a legal obligation.
- ✓ LGs' tariff in [72] solid waste is insufficient to cover cost in a majority of communes. It has to be adapted to give the right price-signal.

15 The distinction between the user charge for current consumption and a replacement charge correspond to the proposition of the cantonal draft law on clean water and will have to be implemented if the law is voted. See Annex I, note. However, despite that a comparable requirement already exists at the federal level since 1997 (amended law of June 20 1997 of the 1991 federal law on the protection of water, in force from November 1, 1997) its implementation is still in 2011 far from effective in Swiss communes!

Bibliography

- Barde, J.-P., 1992, *Economie et politique de l'environnement*, Paris: Presse Universitaire de France.
- Baumol, W., & Oates, W., 1971, "The Use of Standards and prices for protections of the environment", *Swedish Journal of Economics* .
- Buchanan, J., 1968, *The Demand and Supply of Public Good*, Chicago: Rand McNally & Co.
- CDCF, 2008, *Manuel Modèle comptable harmonisé pour les cantons et les communes MCH2*. Conférence des Directeurs Cantonaux des Finances. Berne: Publication du Groupe d'étude pour les finances cantonales, Volume 11.
- Cokins G., 2007, "Activity-Based Cost Management in the Public Sector", in Shah A. (ed.), *op. cit.*, pages 203-233.
- Dafflon, B., 1998, *La gestion des finances publiques locales*, Paris: Economica.
- Dafflon, B., 2006, "Real Property Management in Swiss Communes", in O. Kaganova, & J. McKellar, *op. cit.*, pp. 201-230.
- Dafflon, B., 2010, "L'économie politique de l'eau potable: de la source au robinet, Les enjeux de la gestion publique locale", in Marcou G. et al., *op. cit.*, , pp. 43-60.
- Dafflon B., K. Tóth and A. Baumann, 2004, *La péréquation intercommunale dans le canton de Fribourg: bilan et enjeux*, BENEFRIC Centre d'études en économie du secteur public, Université de Fribourg and Service des communes, Etat de Fribourg.
- European Parliament and Council, *Directive 2000/60/EC of 23 October 2000 establishing a framework for Community action in the field of water policy*, Eur-Lex, Bruxelles.
- European Parliament and Council, *Directive 2008/98/EC of 19 November 2008 on waste*, Official Journal of the European Union, 28.11.2008, L 312/3.
- Kaganova O. and J. McKellar (eds), 2006, *Managing Government Property Assets*, The Urban Institute Press, Washington D.C.
- Knapp, B., 1991, *Précis de droit administratif*, Bâle: Helbing & Lichtenhahn.
- Marcou G. et al. (eds), 2010, *Les enjeux de la gestion locale de l'eau*, GIS-GRALE-CNRS, Droit et Gestion des Collectivités Territoriales, Editions Le Moniteur, Paris.
- OCDE, 1972, *Recommandation du Conseil sur les principes directeurs relatifs aux aspects économiques des politiques de l'environnement sur le plan international*, Paris, 26 mai.
- OCDE, 1998, "User Charging for Government Services", *Occasional Paper 22*, Paris.
- Pigou, A., 1932, *The Economics of Welfare*, London: Macmillan.
- Pillet, G., Oberson, X., Maradan, D., Niederhäuser, N., & Calderari, M., 2001, *Réforme fiscale écologique: fondements, applications*. Bâle: Helbing & Liechtenhahn.
- Shah A. (ed.), 2007, *Budgeting and Budgetary Institutions*, The World Bank, Public Sector Governance and Accountability Series, Washington D.C.
- Schiabi-Campo S., 2007, "The Budget and Its Coverage", in A. Shah (ed.), *op. cit.*, pp. 538.

Annex I Institutional and legal design for [70] distribution of drinking water

	Federal	cantonal (Fribourg)	local	federal court
ownership of water	<p>Fed. Cst. 1999, Article 76 Water (4) The Cantons shall have control over their own water resources. Within the limits of federal law, they may levy dues for water use. The Confederation shall have the right of use water for its transport operations; and where it does it shall pay dues and compensation.</p> <p>Federal law of January 24,1991 on the protection of water, article19-21 The cantons have the obligation to organize the cadaster of waters for protection; they have the right to restrict the use of land to their owner if needed. art. 29-36: Restriction in property rights for the preservation of residual flows of water.</p>	<p>Cantonal law 1972 on the public domain Art. 3 and 4: the Canton is owner of the public domain, which includes all water resources - which produce more than 200 liters/minute.</p> <p>Law of December 18, 2009 on waters, art. 20: The canton defines the perimeters for the protection of underground waters. This can restrict property rights.</p>	<p>Cantonal law 1972 on the public domain: art. 40, 41 and 51 If the water resource delivers more than 200 liters/min. the State gives a concession to the commune. A concession from the canton is necessary for any water resources of 25 l./min. and more.</p>	
definition of "drinking" water, quality	<p>Federal Ordinance of November 23, 2005 on drinking water, spring water and mineral water, art. 2 and 3</p>	<p>Cantonal law 1979 on drinking water* art. 2 refers to the federal standards art. 9-12 the communes are responsible for the quality</p>	<p>Cantonal law 1979 on drinking water art. 9-12 the communes are responsible for the quality</p>	
objective	<p>Fed. Cst. 1999, Article 76 Water (1) Within the limits of its powers, the Confederation shall ensure the rational use and the protection of water resources, and shall combat the harmful effects of water. (2) It shall establish principles on the conservation and development of water reserves, on the use of water both for the production of energy and for cooling purposes and also on other interventions in the water cycle. (3) It shall legislate on water protection, on securing sufficient residual water, on hydraulic engineering, on the safety of dams and on actions to influence rainfall.</p>	<p>Cantonal Cst. 2004 Art. 77 distribution of water and energy The State and the communes guarantee the furniture of drinking water and energy.</p> <p>Cantonal law 1979 on drinking water* art. 8 the commune care that houses and public building have enough drinking water</p>	<p>Cantonal law 1979 on drinking water art. 8 the commune care that houses and public building have enough drinking water</p>	

	Federal	cantonal (Fribourg)	local	federal court
coordination	<p>Fed. Cst. 1999, Article 76 Water ... (5) In consultation with the cantons concerned, the Confederation shall decide on the rights to water resources of interest to other states and shall set the rates for their use. If the Cantons concerned cannot agree on rights to inter-cantonal water reserves, the Confederation will decide the matter. (6) In fulfilling its tasks, the Confederation shall take into account the interests of those Cantons from which the water originates.</p> <p>Federal law of January 24, 1991 on the protection of water, art. 19-21: The cantons have the obligation to organize territorial zones for the protection of underground and running water for water supply. (3) It shall legislate on water protection, on securing sufficient residual water, on hydraulic engineering, on the safety of dams and on actions to influence rainfall.</p>	<p>Cantonal law 1972 on the public domain Art. 24: in delivering concession, the Canton must consider the efficient use of water resources.</p> <p>Cantonal law 2009 on water art. 10 priority is for drinking water</p>	<p>Cantonal law 1980 on the communes, art. 109 art. 109: Autonomous; horizontal coordination is obtained either through bilateral contract or convention, or through the creation of an association of communes for the production and delivery of drinking water.</p> <p>Law of December 18, 2009 on waters, art. 39: Planning and construction of the equipment within their own drainage basin; capacity building; quality control. Finance: the communes can require a user charge up to 5 centimes per m3 of water consumption.</p>	
production and delivery			<p>Cantonal Cst. 2005 Art. 77 and cantonal law 1979 on drinking water art. 8. Normally the communes will produce and deliver directly drinking water; but outsourcing is possible, though not frequent (less than 20% in Switzerland)</p>	
pricing	<p>Fed. Cst. 1999, Article 76 Water (4) The Cantons shall have control over their own water resources. Within the limits of federal law, they may levy dues for water use. The Confederation shall have the right of use water for its transport operations; and where it does it shall pay dues and compensation.</p>		<p>Cantonal law 1979 on drinking water art. 13 Pricing is at the local level Cantonal law 1980 on the communes, art. 10 Competence of the legislative local assembly; delegation to the executive is possible if it fixes (1) the users, (2) the object of the user charge, (3) criteria for the tariff,(4) the maximum amount of the charge</p>	<p>Case law of the Federal Court: ATF 118 Ia 320, October 1992 ; ATF 120 Ia 171, July 1994 ; ATF 122 I 61, June 1996, ATF 126 I 180, June 2000 ; ATF 128 I 46, October 2001 et ATF 129 I 346, June 2003.</p>
control		<p>Cantonal law 1979 on drinking water* art. 4 and 14-22 from the point of view of the sanitary quality of the drinking water</p>	<p>Cantonal law 1980 on the communes, art. 153 The user can contest the payment of a user charge. His motivation must respect the administrative procedure.</p>	

*At the moment (May 2011) a draft law on the drinking water is debated in Parliament. Main changes are that the production and distribution of water should be concessioned to local public bodies only (communes, association of communes, public local entities), to the exclusion of any corporate or private (commercial) society (draft law art.4). The equipment and infrastructure will belong to the public bodies (art. 5). The communes will be held responsible for the delivery of drinking water on their territory (art. 14) even though they can outsource the production and delivery to an association of communes, or a public legal entity.

Art. 25 prescribes a pricing that will guarantee the full cost cover, that is existing capital investment (through amortization), the extension and renewal of the installations, financial, current and maintenance costs. The tariff includes the following charges: (i) access charges, (ii) contribution for new equipment, (iii) basic charge for annual fix costs, (iv) user charge for current variable costs in proportion of consumption (cubic meters), (v) basic charge for fire defense. In fact, article 25 of the draft law reproduces the present financial articles that the model regulation for the communes contains. Since more than 80% of the communes have adopted the model regulation rules, the canton thought it easier to introduce them in the new law for the sake of simplicity, transparency and to reinforce coherence and horizontal coordination. It will also permit performance analysis through benchmarking with the objective to increase further productive efficiency.

Sources: Federal Constitution of April 18, 1999; Ordonnance du DFI sur l'eau potable, l'eau de source et l'eau minérale du 23 novembre 2005 (CH : RS 817.022.102) ; FR Cantonal constitution of May 16, 2004 ; Loi FR du 30 novembre 1979 sur l'eau potable (FR : RS 821.32.1) ; Règlement FR du 13 octobre 1981 d'exécution de la loi du 30 novembre 1979 sur l'eau potable (FR : RS 821.32.11) ; Avant-projet DIAF/ 27.05.2010 de la loi sur l'eau potable

Note: except for the federal Constitution, the legal texts do not exist in English. Our free translation with the aim to reproducing the meaning of the law, without any claim for a word-to-word correspondence.

Annex II Institutional and legal design for the sewage and wastewater treatment

	Federal	cantonal (Fribourg)	local
objective	<p>Fed. Cst. 1999, Article 76 Water: see Annex I</p> <p>Federal law of January 24, 1991 on the protection of water, art. 2: a. health preservation; b. guarantee drinking water supply; c. safeguard natural biotope; d. protect fishing waters; e. protect landscape; f. irrigation for agriculture; g. use of water for leisure; h. hydrological regime.</p>	<p>Cantonal constitution of May 16, 2004, Art. 71a) Environment The cantonal State and the communes are co-responsible for the protection of the environment and for taking measures against pollution and nuisances.</p> <p>Law of December 18, 2009 on waters, art. 1: General clause of implementation and coordination of the federal laws concerning "waters", except for the supply of drinking water and hydro-electric uses of water, which are organised in specific separate laws.</p>	
coordination	<p>Federal law of January 24, 1991 on the protection of water, art. 7, 10: the cantons are responsible for the regional and local planning of sewage and wastewater treatment art. 13, 15 the cantons are responsible for the control of quality. Art. 45: general legal obligation of the cantons to ensure the implementation, the supervision and the coordination of the law.</p>	<p>Law of December 18, 2009 on waters, art. 3: The canton draws the map of drainage basin and the main water divide of the hydro-geographic basin. The communes have to plan their sewage and wastewater treatment accordingly.</p>	
implementation measures	<p>Federal law of January 24, 1991 on the protection of water, art. 7: polluted and used waters must be treated before returning to the natural basin art. 9: the federal government issues the necessary regulation for preserving the waters, on sewage, wastewater treatment, infiltration and the use of products which could endanger the quality of waters. Art. 45: General clause of implementation, supervision and coordination.</p>		<p>Cantonal Law of December 18 on waters, 2009, art. 9: General competence given to the communes (alone or in specific service precincts) to execute and implement the law; issue local regulation on implementation and financing. Art. 12: the communes are responsible for building the necessary equipment (sewage and wastewater treatment). Art. 39: planning and construction of the equipment within their own drainage basin; capacity building; quality control. Finance: the communes can require a user charge up to 5 centimes per m3 of water consumption.</p>

	Federal	cantonal (Fribourg)	local
pricing	<p>Federal law of January 24, 1991 on the protection of water, art. 3a: introduces the polluter-pays principle (from November 1, 1997).</p> <p>Art. 11: users of the sewage system and the wastewater treatment equipment must support the costs.</p> <p>art. 61a (introduced in 1997): Costs for investment, maintenance, replacement of the equipment, running costs, financial costs for the protection of waters are charged according to the causality or origin principles. The tariff depends from:</p> <ul style="list-style-type: none"> a. the nature and quantity of wastewater; b. the necessary amortization to keep the constant use value of the equipment; c. interests; d. maintenance and replacement investments; new equipment with better depolluting techniques. <p>The owners of the equipment (note: LGs on most cases) must constitute the necessary financial reserves. The method of tariff calculation must be published and accessible to the public.</p>	<p>Law of December 18, 2009 on waters: art. 39-44 define the rules to be respected by the communes for financing the service through the polluter-pays principle.</p>	<p>Cantonal law of December 18, 2009 on waters:</p> <p>art. 40: general principles Charges must finance the communal and intercommunal equipment for sewage and wastewater treatment, and replacement costs. Charges must be commensurate with the service received. Charges are levied on both built and non-built immovable properties within the defined service perimeter.</p> <p>Art. 41: access charges Access charges cover the investment costs. For building, the entire charge is calculated. For non-built immovable properties within the perimeter, it is replaced by a preference charge to a max. of 70% of the access charge (the remaining 30% will be paid on the delivery of the building permit).</p> <p>Art. 42 Annual basis charges The annual basis charge covers:</p> <ul style="list-style-type: none"> a) fixed costs: interest and amortization (debt instalment) and the outlays for maintaining the use value of the equipment; b) the costs of the inter-communal equipment within the drainage basin. <p>Amortization is calculated on the economic lifespan of the equipment; rate of amortization is linear.</p> <ul style="list-style-type: none"> c) replacement and development equipment costs, on the basis of the communal planning within the drainage basin. <p>The basis charge must cover at least 60% of the historical and calculated costs above.</p> <p>Art. 43: user charges The ordinary annual user charge must cover the total remaining annual costs of the service (total costs minus investment, interest and amortization).</p>
control	<p>Federal law of January 24, 1991 on the protection of water: The law distributes the responsibility of control between the federal administration and the cantons; Federal government: art. 22, 46, Cantons: art. 13, 15, 32,</p>	<p>Law of December 18, 2009 on waters, art. 5: Control that the communes respect the hydro geography drainage basins in their planning. Includes quality control</p>	
<p><i>Sources:</i> Federal Constitution of April 18, 1999; Loi fédérale sur la protection des eaux du 24 janvier 1991 (CH : RS 814.20) ; Ordonnance fédérale sur la protection des eaux du 28 octobre 1998 (CH : RS 814.201) ; FR Cantonal constitution of May 16, 2004 ; Loi FR du 18 décembre 2009 sur les eaux (FR : RS 812.1) ; Arrêté du 7 décembre 1992 d'exécution de la loi fédérale sur la protection des eaux (FR : RS 812.11).</p>			

Annex III Institutional and legal design for [72] solid waste collection and treatment

	Federal	cantonal (Fribourg)	local
objective	Federal law of October 7, 1983 on the protection of environment, art. 1: conservation of natural resources, biotope, biodiversity and soil fertility. Art. 30: reducing the production of solid waste; sorting out and valorisation; treatment or incineration.	Cantonal law of on November 13, 1996 on solid waste management, art. 1-3: refer to the federal law	
coordination	Federal law of October 7, 1983 on the protection of environment, art. 31: coordination is the responsibility of the cantons within their territory; inter-cantonal cooperation for incinerators in order to avoid excess capacity. Federal Ordinance of December 10, 1990, on the treatment of solid waste, art. 15-16: obligation of the cantons: planning of the categories, quantity and quality of the solid waste production, management policy inside and between cantons	Cantonal law of on November 13, 1996 on solid waste management, art. 4-5: refer to the federal law	
production and delivery	Federal law of October 7, 1983 on the protection of environment, art. 31: the cantons define the geographical territory of service (incinerator) for efficiency and economies of scale (introduced in 1997). Art. 36: the cantons are responsible for the implementation of the law. Federal Ordinance of December 10, 1990, on the treatment of solid waste, art.6-14: define the nature, quality and valorisation of solid waste or the treatment. Art. 17-18: the cantons must define the localisation of incinerators (inter-cantonal, economies of scale) and the geographical territory (the communes that belong to the service limits) for each incinerator. Art. 38-42: detail prescription concerning incinerators.	Cantonal law of on November 13, 1996 on solid waste management, art. 2: definition of the solid wastes: refer to the federal law. art. 20-21: cantonal responsibility in defining the geographical zone per incinerator.	Cantonal law of on November 13,1996 on solid waste management, art. 10: the communes are responsible for implementation of the law. Art.13-14: define the responsibility of the commune for collection and creation of household waste recycling centres.
pricing	Federal law of October 7, 1983 on the protection of environment, art. 2 and 32: introduce the polluter-pays principle art. 32a (introduced in 1997): Financing through user charges following the causality principle (polluter-pays); therefore the tariff must be proportionate to the type and quantity of solid waste. It should cover: construction and maintenance costs of the equipment, including household waste recycling centre (HWRC) and incinerator; interest and amortisation; the necessary reserve for the replacement and development of the equipment.		Cantonal law of on November 13, 1996 on solid waste management, art. 10, 22-23: financing at the local level through the polluter-pays principle; user charges must cover at least 70% of total costs. The charge must be proportional to the quantity (volume or weight) for at least half of the total costs; special user charges are possible for HWRC.

control	Federal law of October 7, 1983 on the protection of environment, art. 38: the federal government controls the cantons on the implementation of the law.	Cantonal law of on November 13, 1996 on solid waste management, art. 1-3:	
<i>Sources:</i> Loi fédérale sur la protection de l'environnement du 7 octobre 1983 CH RS 814.01); Federal Ordinance of December 10, 1990, on the treatment of solid waste (CH RS 814.600); FR Loi du 13 novembre 1996 sur la gestion des déchets (FR RS 810.2); Règlement du 20 janvier 1998 sur la gestion des déchets (FR RS 810.21).			

Annex IV Cost coverage ratio for functions [70], [71], [72], per district, 1996-2009

District	function	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Broye	water 70	92,1%	97,0%	92,0%	93,1%	93,5%	98,4%	93,2%	93,0%	94,1%	94,2%	95,1%	93,6%	95,5%	98,2%
	wastewater 71	75,4%	62,7%	61,9%	65,7%	72,4%	77,6%	89,1%	90,6%	92,9%	91,5%	92,7%	93,1%	89,8%	95,9%
	solid waste 72	57,3%	58,6%	69,9%	66,4%	75,5%	81,0%	85,9%	89,1%	90,6%	89,0%	88,4%	92,8%	90,9%	93,1%
Glâne	70	100,6%	100,0%	99,4%	96,9%	98,6%	97,8%	100,4%	100,7%	98,8%	105,7%	105,5%	103,7%	106,6%	106,4%
	71	74,7%	87,6%	85,6%	84,5%	85,7%	79,2%	80,9%	77,9%	83,8%	91,6%	94,8%	95,0%	94,9%	95,6%
	72	38,0%	37,3%	38,4%	61,6%	67,4%	76,8%	78,2%	84,5%	86,8%	85,7%	82,5%	85,3%	85,6%	80,9%
Gruyère	70	99,0%	97,8%	98,8%	98,1%	92,2%	96,2%	94,8%	91,1%	91,9%	89,8%	83,4%	91,1%	90,0%	92,4%
	71	58,1%	62,3%	65,2%	65,2%	62,5%	63,4%	78,5%	79,8%	83,0%	87,2%	91,2%	90,4%	91,3%	95,1%
	72	46,4%	42,8%	43,8%	41,2%	71,7%	61,1%	76,4%	75,7%	77,5%	79,9%	73,7%	78,2%	80,6%	86,5%
Sarine	70	110,6%	101,7%	97,9%	97,6%	100,4%	100,7%	98,5%	99,3%	98,0%	94,7%	97,4%	99,8%	99,6%	96,3%
	71	91,3%	88,8%	84,6%	88,7%	82,2%	83,8%	89,1%	92,0%	90,5%	89,8%	91,2%	93,8%	94,1%	95,1%
	72	41,3%	49,3%	56,5%	76,7%	90,9%	82,9%	91,3%	121,3%	106,5%	83,3%	92,3%	110,8%	108,5%	107,2%
Lake	70	96,6%	100,4%	97,2%	99,9%	96,4%	99,0%	95,1%	97,9%	97,7%	101,9%	100,4%	96,2%	89,6%	98,4%
	71	76,0%	78,2%	79,8%	78,0%	90,3%	87,5%	86,3%	92,6%	89,5%	90,9%	82,7%	79,2%	83,8%	84,3%
	72	74,0%	78,7%	85,1%	86,1%	89,3%	89,9%	92,5%	94,3%	91,7%	88,5%	88,9%	88,6%	91,8%	91,1%
Singine	70	101,0%	102,3%	106,6%	100,7%	109,6%	108,5%	97,8%	99,0%	101,1%	101,0%	101,5%	102,9%	99,0%	103,5%
	71	84,1%	78,6%	91,5%	89,4%	89,2%	87,7%	88,4%	94,0%	90,2%	91,9%	96,6%	95,3%	95,1%	96,8%
	72	84,6%	86,0%	86,6%	86,5%	94,4%	93,0%	97,0%	96,5%	97,0%	97,2%	96,2%	97,3%	95,4%	95,2%
Veveyse	70	88,5%	97,8%	89,4%	96,1%	100,6%	97,7%	98,7%	90,3%	94,8%	93,5%	93,4%	95,6%	95,5%	92,0%
	71	60,9%	63,5%	67,2%	73,5%	73,7%	67,0%	71,6%	78,1%	86,6%	89,2%	98,3%	92,9%	91,7%	94,5%
	72	74,6%	74,7%	69,4%	76,0%	77,7%	85,4%	77,6%	81,4%	83,0%	84,3%	82,1%	80,9%	75,6%	76,1%
Canton	70	99,3%	99,5%	97,8%	97,5%	97,9%	99,5%	96,4%	96,1%	96,6%	96,4%	95,9%	97,0%	95,5%	97,6%
	71	81,8%	79,2%	79,5%	80,7%	80,2%	80,1%	85,7%	88,9%	88,9%	90,1%	91,2%	91,1%	91,7%	93,8%
	72	53,5%	56,5%	61,6%	71,5%	85,3%	81,2%	87,9%	104,3%	95,6%	85,5%	88,1%	97,6%	96,8%	97,1%

Source : authors' calculation on the basis of communal accounts 1996-2009; gross data given by the Service des communes, Canton Fribourg

Author

Bernard DAFFLON

Professor of Public Finance and Public Policies at the Department of Political Economy, University of Fribourg since 1986. More on www.unifr.ch/finpub

Sandra DAGUET

Research assistant and Ph.D candidate for the Chair of Public Finance, University of Fribourg since 2008. More on www.unifr.ch/finpub

Abstract

This paper deals with the management of three environmental policies at the local level: clean water distribution, sewage and wastewater treatment and household solid waste collection and treatment. The argument is that applying the benefit principle for financing these services will enhance allocative efficiency, budget and environmental accountability, and contribute to induce environmental friendly attitude. The paper is organised in two parts. Because there is no fundamental seminal theory in environmental management, Part One summarizes the analytical foundations in combining three disciplines: political economy, law and environmental accounting. The original contribution of the paper is to mix them in a coherent process which also corresponds to the Directives 2000/60 and 2008/98 of the European Parliament in the fields of water policy and solid waste.

Part Two develops a possible technique for defining and measuring the performance in order to assess the feasibility of our proposal. The data cover the 168 communes of the Canton Fribourg for the 1996-2009 period. The tested hypothesis is that the cost coverage ratio is an accurate measure of performance in the management of the selected environmental functions. But for accuracy - thus for improvement in policy implementation and practices - the test requires an in-depth command of the real situations because available data need to be treated before measurement. With the proposed procedure, the results verify efficiency in production, full information and no strategic behaviour from economic agents and politicians, and managerial accountability.

Keywords

Benefit principle of taxation, environmental accounting, environmental legislation, environmental policy, environmental taxation, polluter-pays principle, user charges, user-pays principle, performance analysis in environmental management.

JEL Classification

H23, Q53, Q58

Citation proposal

Dafflon Bernard, Daguet Sandra 2012. «Performance measurement in environmental management at the local level: an experiment and proposal with reference to Switzerland». Working Papers SES 425, Faculty of Economics and Social Sciences, University of Fribourg (Switzerland)

Working Papers SES

Last published :

- 421 Isakov D.: Technical Analysis with a Long-Term Perspective: Trading Strategies and Market Timing Ability; 2011
- 422 Dembinski P.: Encyclical Letter "Caritas in Veritate": An Economist's Reading; 2011
- 423 Panzera F.: Price stability and financial imbalances: rethinking the macrofinancial framework after the 2007-8 financial crisis; 2011
- 424 Dafflon B.: The Political Economy of Decentralisation in Sikkim: Strengthening Gram Panchayat Planning and Budgeting; 2011

Catalogue and download links:

<http://www.unifr.ch/ses/wp>

http://doc.rero.ch/collection/UNIFR_WORKING_PAPERS_SES